

April 17, 2014

Mr. Tom Gainer
Oregon Department of Environmental Quality
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

**Subject: Response to DEQ Comments
Annual 2013 Groundwater Monitoring and LNAPL Removal Report
Port of Portland Terminal 4 Slip 3**

Dear Tom:

This letter provides the Oregon Department of Environmental Quality (DEQ) with a response to the comments received on the Terminal 4 Slip 3 *Annual 2013 Groundwater Monitoring and LNAPL Removal Report* (Apex, 2014). The comments were provided to the Port of Portland (Port) in a letter from the DEQ dated March 18, 2014. The DEQ comments are repeated (in italics) followed by the Port response.

1. *Section 4.5 Conclusions and Recommendations, page 7, second paragraph and last sentence. The statement that the LNAPL removal program should be terminated and that Items 1 through 4 have been achieved is incorrect due to the following:*
 - a) *The recovered quantity of LNAPL from monitoring well MW-20 exceeded 5 gallons in 1 year.*
 - b) *Recovery of LNAPL from MW-20 does not show a consistent decreasing trend because the quantity of LNAPL recovered at MW-20 in 2012 exceeded the quantity of LNAPL recovered in 2011.*

Response. The compliance criteria for groundwater monitoring and LNAPL removal were defined in the report *LNAPL Removal, Groundwater Monitoring, and Contingency Plan* (BBL/ACA/Newfields, 2005) and further specified in the *Site Closure Evaluation and Recommendation—Groundwater* (ACA, 2009). A summary of the criteria follows:

- LNAPL monitoring/removal will continue as long as the total recovery rate is greater than 50 gallons per year. After the total recovery rate falls below 50 gallons per year, individual wells will continue in the LNAPL monitoring/removal program until: (1) the trend in recovery rate is downward; or (2) the recovery rate is less than 5 gallons per year.

The data exhibit a downward trend since 2004 based on multiple trend analysis methods (e.g., best fit line, Mann-Kendell, Theil-Sen). Additionally, the slope of the downward trend has increased over the last four years.

The compliance criteria have been met given the consistent decreasing trend and criterion for an individual well as *either* a downward trend or recovery rate of less than five gallons per year.

2. *Section 4.5 Conclusions and Recommendations, page 7, Item No. 4. Concentrations of BAA and BAP in sentinel monitoring wells BE-5 and BE-3 have not been stable or declining for at least three years as shown in the chemical concentration trend plots in Appendix D.*

Response. To evaluate the trends in concentrations for BAA and BAP in monitoring wells BE-3 and BE-5, a Mann-Kendall statistical evaluation was completed on each data set (in accordance with Air Force Center for Environmental Excellence (AFCEE) Long-Term Monitoring Optimization guidance; AFCEE, 2006). The Mann-Kendall test is a non-parametric statistical procedure for analyzing trends in evenly spaced data over time for data sets of sufficient size (typically considered to be at least 7 sample points). The Mann-Kendall statistic (S) is used to characterize trends in the data. Positive values indicate an increase in concentrations over time, whereas negative values indicate a decrease in concentrations over time. The strength of the trend is proportional to the magnitude of the Mann-Kendall Statistic (i.e., large magnitudes indicate a strong trend). A confidence in the trend is calculated (using the Kendall probability table) and the confidence level is used together with the Mann-Kendall statistic to define the trend based on the following table:

| Mann-Kendall Statistic | Confidence in Trend | Defined Concentration Trend |
|------------------------|---------------------|-----------------------------|
| > 0 | > 95% | Increasing Trend |
| > 0 | 90% - 95% | Probably Increasing Trend |
| > 0 | < 90% | No Trend |
| ≤ 0 | < 90% and COV ≥ 1 | No Trend |
| ≤ 0 | < 90% and COV < 1 | Stable |
| < 0 | 90% - 95% | Probably Decreasing Trend |
| < 0 | > 95% | Decreasing Trend |

S = Mann-Kendall Statistic

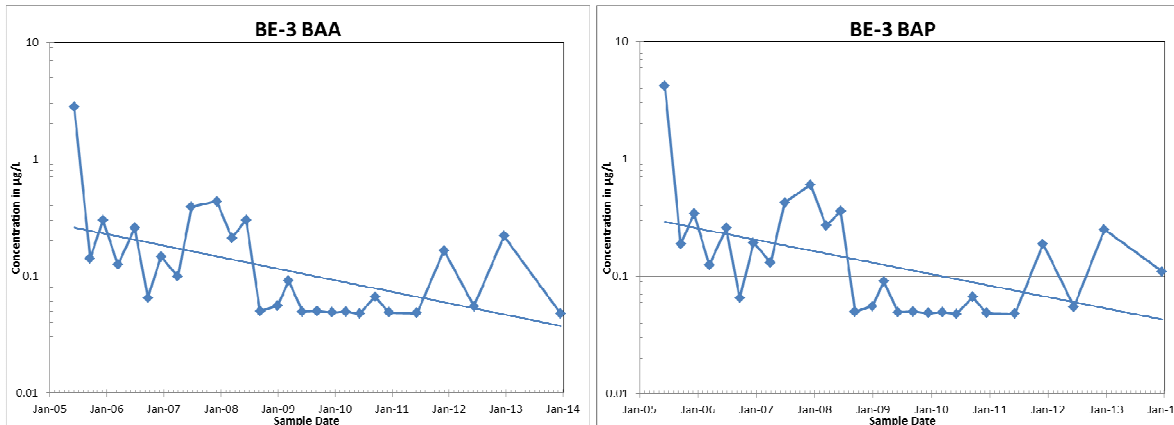
COV = Coefficient of Variation (Ratio of the standard deviation to the mean)

The statistical analysis of BAA and BAP in BE-3 and BE-5 was conducted using the data from June 2005 through December 2013. The results show a statistically significant downward trend in the historical data sets for both BAA and BAP in well BE-3 (with confidence values of 99% or greater) and a stable trend for both BAA and BAP in well BE-5 (trend confidence values are less than 90 percent, and COV values are less than 1).

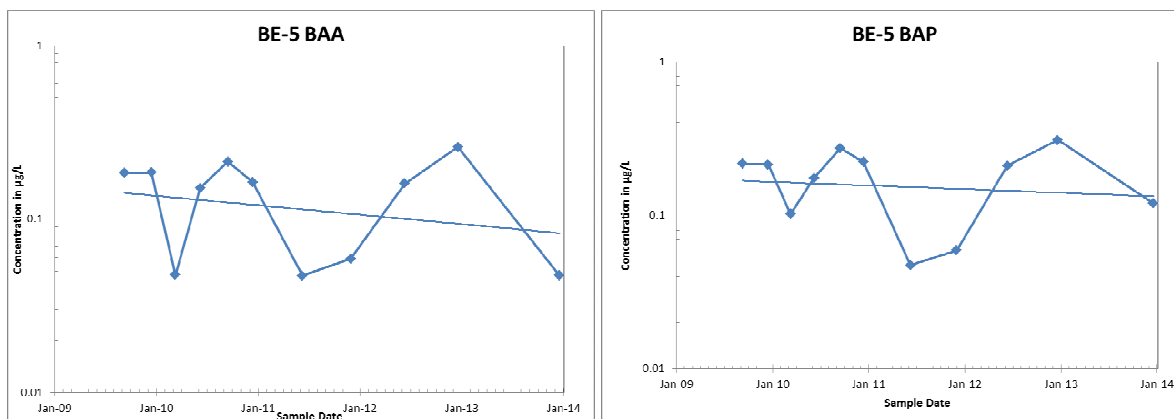
If the data set is abridged to the last three years (December 2010 through December 2013), the Mann Kendall evaluation cannot be completed due to an insufficient number of data points. Straight-line regressions through this three year data set (as calculated by the Excel regression function; presented below) indicate slightly positive slopes on the order of 0.01 to 0.03 µg/L per year. These slopes are essentially flat and represent conditions near the

detection limit with interspersed detections and non-detects. These results are characteristic of a stable condition. The compliance criteria have been met given the stable or declining trend for a continuous period of at least three years.

Well BE-3



Well BE-5



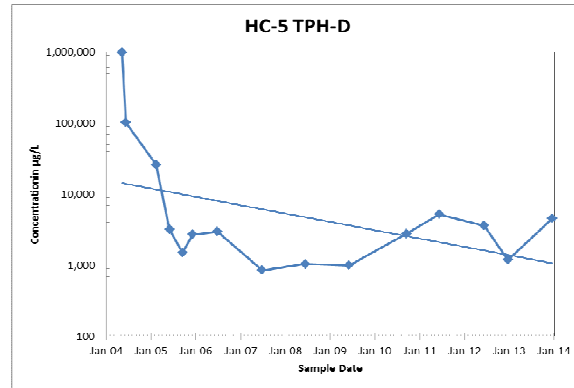
3. In addition, the concentration of diesel-range organics have not been stable or declining for at least three years in monitoring well HC-5 as shown in the chemical concentration trend plots in Appendix D. These data indicate the groundwater sampling program should not be terminated as the report recommends.

Response. A Mann-Kendall statistical evaluation was completed on the TPH data from well HC-5 (as described above). The results of the statistical analysis show no statistically significant concentration trend (the trend confidence value is less than 90%). A straight-line regression of the data set (shown in the plot included below) indicates a notable downward tendency in the data (an average decrease of 1,500 µg/L/year).

If the data set is abridged to the last three years (September 2010 through December 2013), the Mann Kendall evaluation cannot be completed due to an insufficient number of data points. A straight-line regression calculated through this three year period data set (Excel

regression function; presented below) indicates a negative slope (12 µg/L per year). These results are characteristic of a stable or decreasing condition. The compliance criteria have been met given the stable or declining trend for a continuous period of at least three years.

Well HC-5



4. *Table 4 Summary of Groundwater Analytical Results, page 1, HC-5. The field duplicate result of 4,600 JY micrograms per liter (µg/L) for diesel-range Total Petroleum Hydrocarbons should be presented on Figure 6. Presenting the higher concentration between the primary and field duplicate sample is a more conservative approach for environmental monitoring. The concentration trend plot should also be revised to present the more conservative value.*

Response. Noted.

5. *Appendix C, LNAPL Thickness and Recovery Trend Plots. The scale for "NAPL Removed (gal)" on the graphs for all monitoring wells included in Appendix C should be revised so that any downward trend of recoverable NAPL can be visualized.*

Response. The plots in Appendix C have been modified to show the LNAPL removed for individual events on an expanded scale secondary y-axis.

6. *Appendix D. The concentration trend plots should include a description of what "Expon." trend lines represent and how they were calculated.*

Response. The trend line presented is the "exponential" option as defined in Microsoft Excel (i.e., the option that provides a straight line fit to a semi-log plot, as used in the trend plots). As needed, this will be clarified in future plots.

Based on the responses provided and the results from the additional multiple trend analysis methods, the Port requests a meeting to discuss the original recommendation of terminating the LNAPL removal and groundwater monitoring program at Terminal 4 Slip 3.

Please call me at (503) 415-6676 if you have any questions.
Sincerely,



Kelly Madalinski
Environmental Project Manager

Attachment:

Attachment A - Revised Annual 2013 Groundwater Monitoring and LNAPL Removal Report - Appendix C

References:

Ash Creek Associates (Ash Creek), 2009. *Site Closure Evaluation and Recommendation—Groundwater*, Terminal 4 Slip 3 Upland Facility. May 14, 2009.

AFCEE, 2006. AFCEE Long-Term Monitoring Optimization Guidance. 2006.

Apex Companies, LLC (Apex), 2014. *Annual 2013 Groundwater Monitoring and LNAPL Removal Report*, Terminal 4 Slip 3 Upland Facility. January 31, 2014.

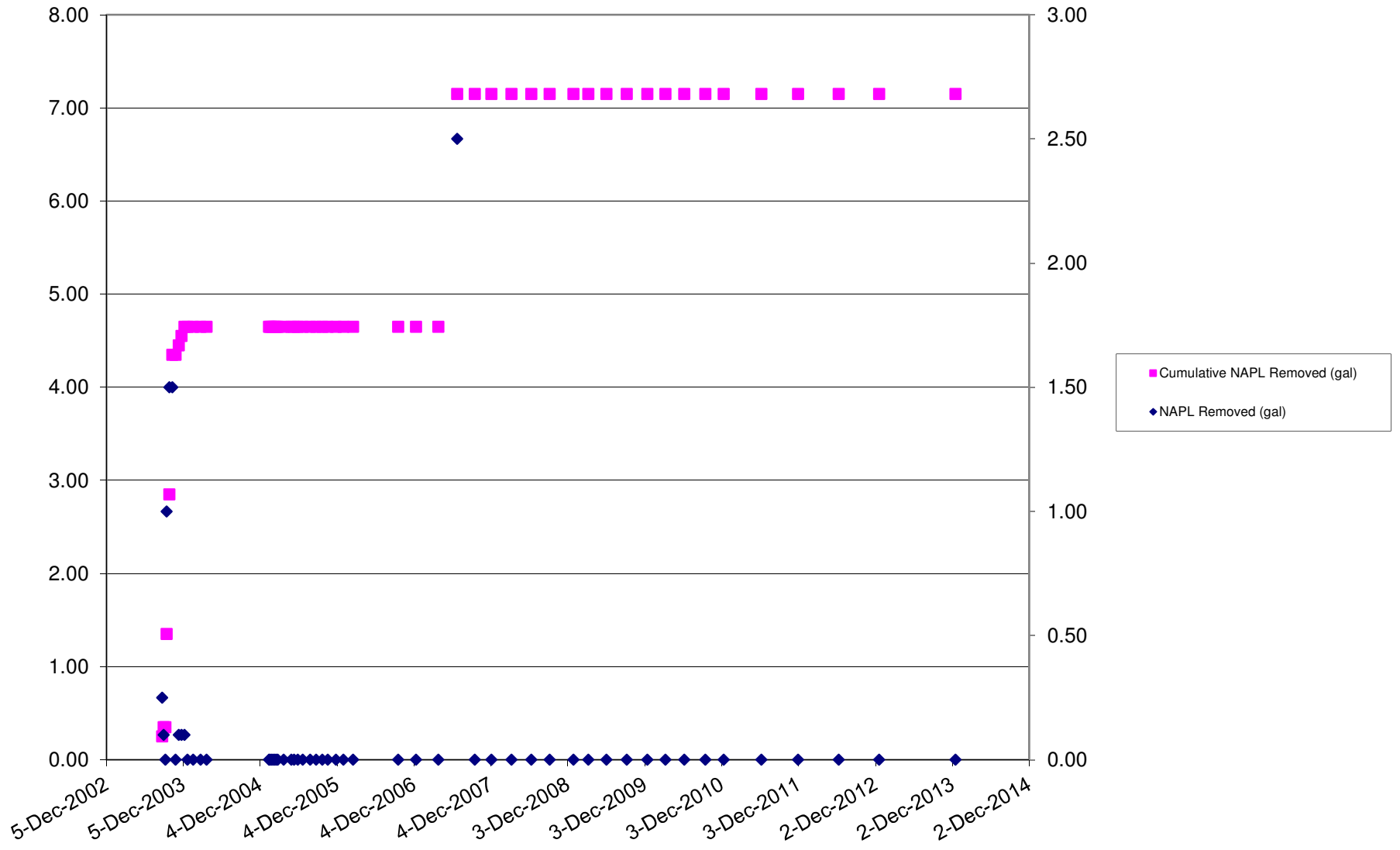
BBL/ACA/Newfields, 2005. *LNAPL Removal, Groundwater Monitoring, and Contingency Plan*, Terminal 4 Slip 3 Upland Facility. June 16, 2005.

c: Kristine Koch, EPA
Rich Muza, EPA
Sean Sheldrake, EPA
Lance Peterson, CDM
Suzanne Barthelmess, Port
David Breen, Port
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Michael Pickering, Apex Companies, LLC
Mark Lewis, Formation Environmental
LWP File

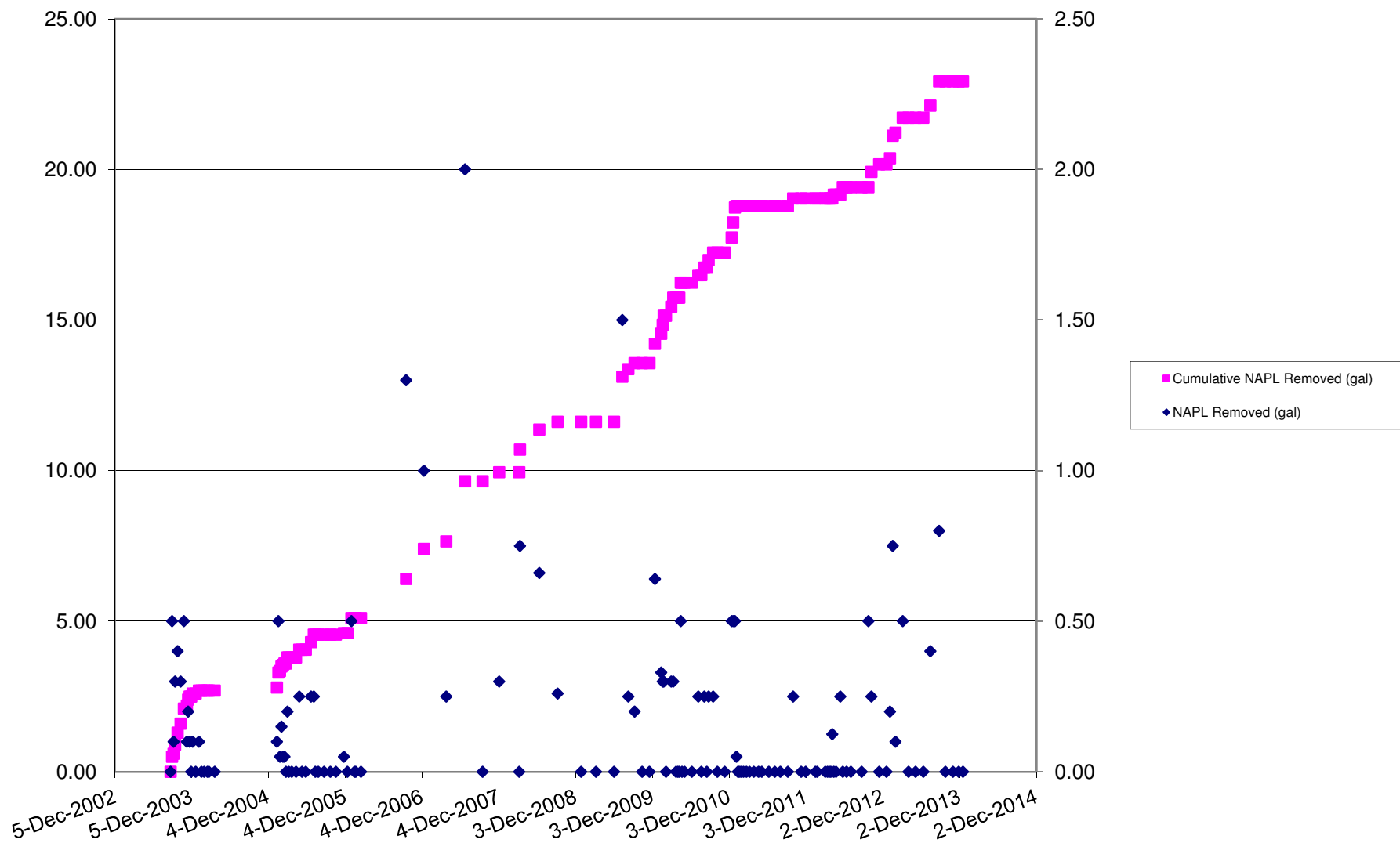
Attachment A

Revised Annual 2013 Groundwater Monitoring and LNAPL Removal Report - Appendix C

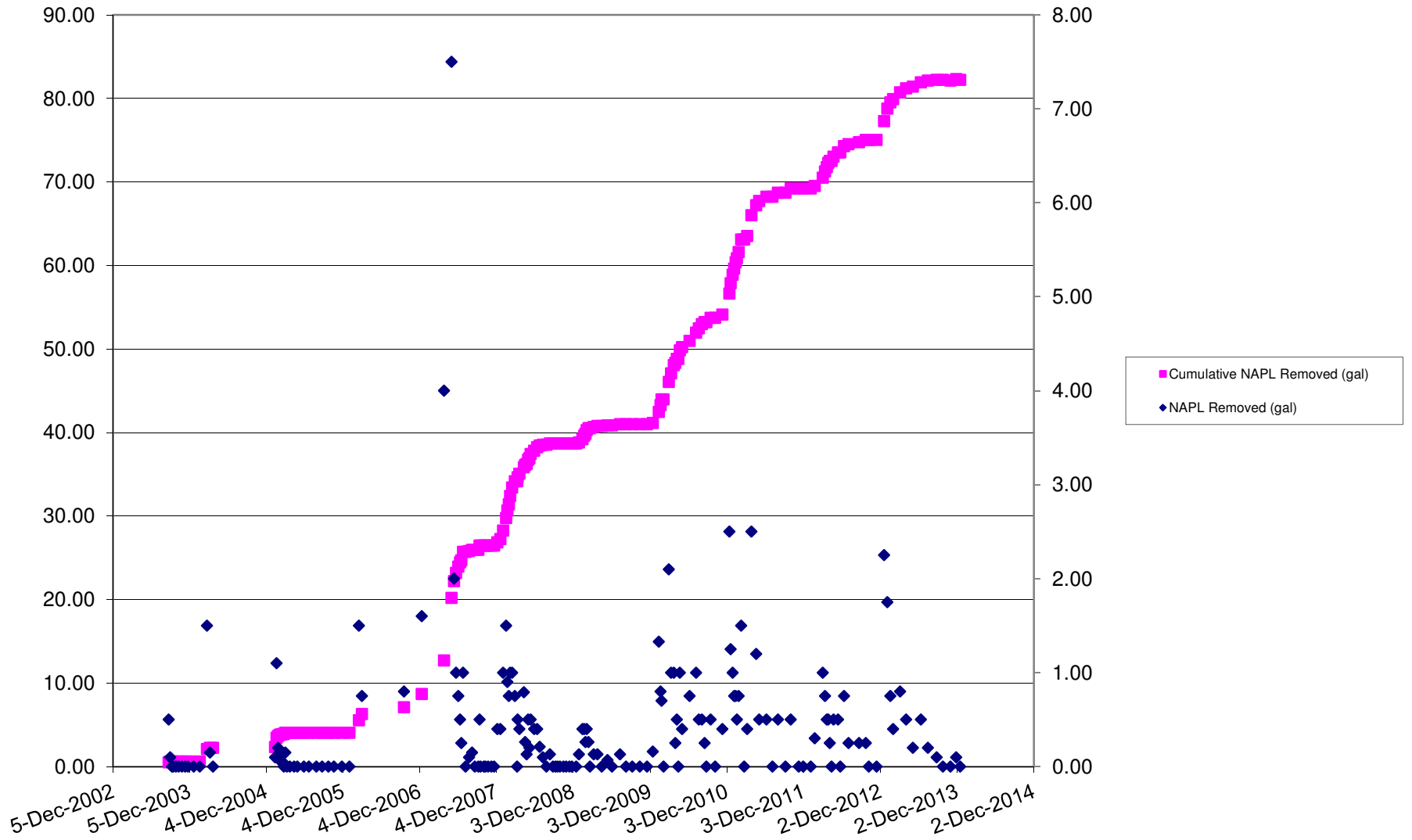
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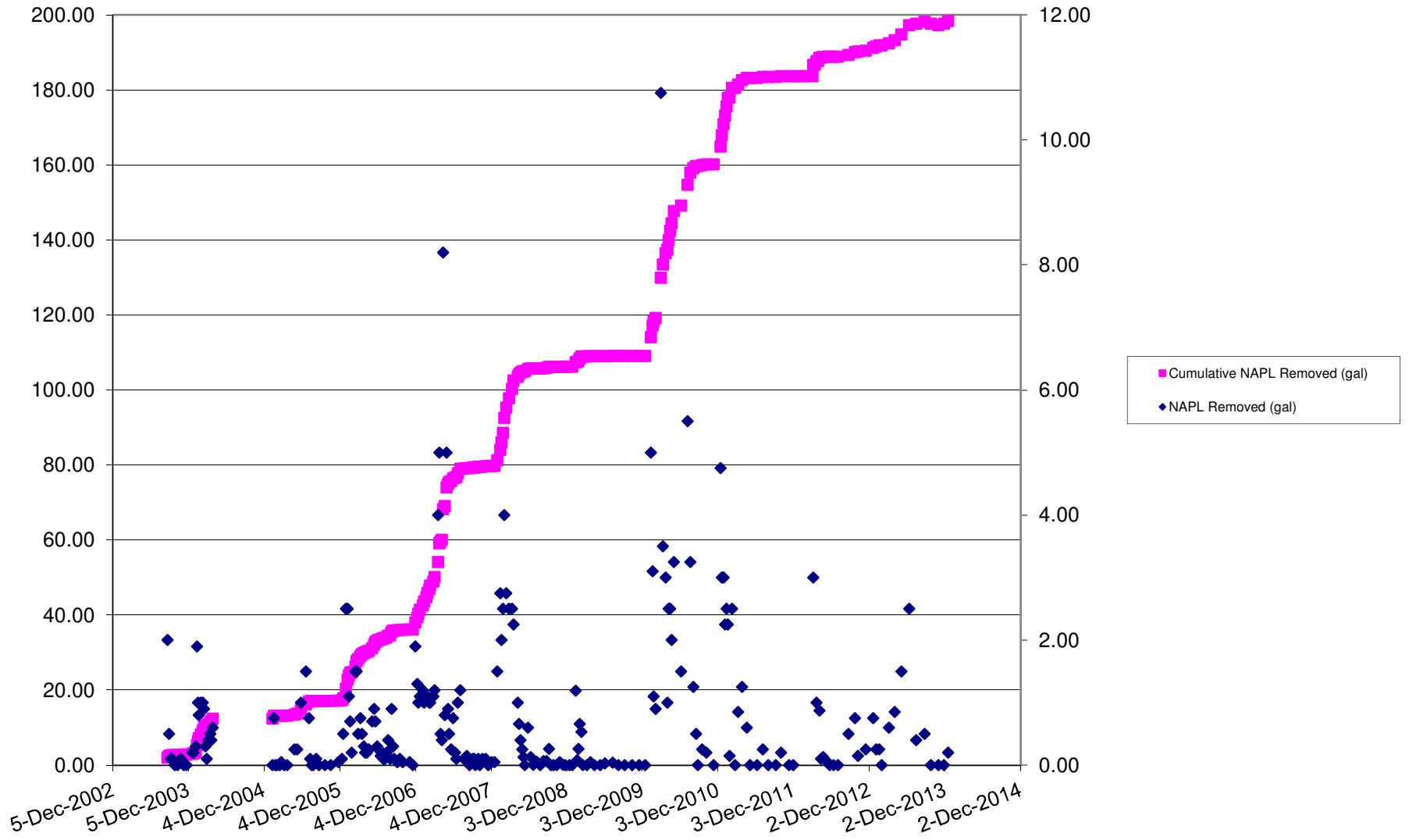
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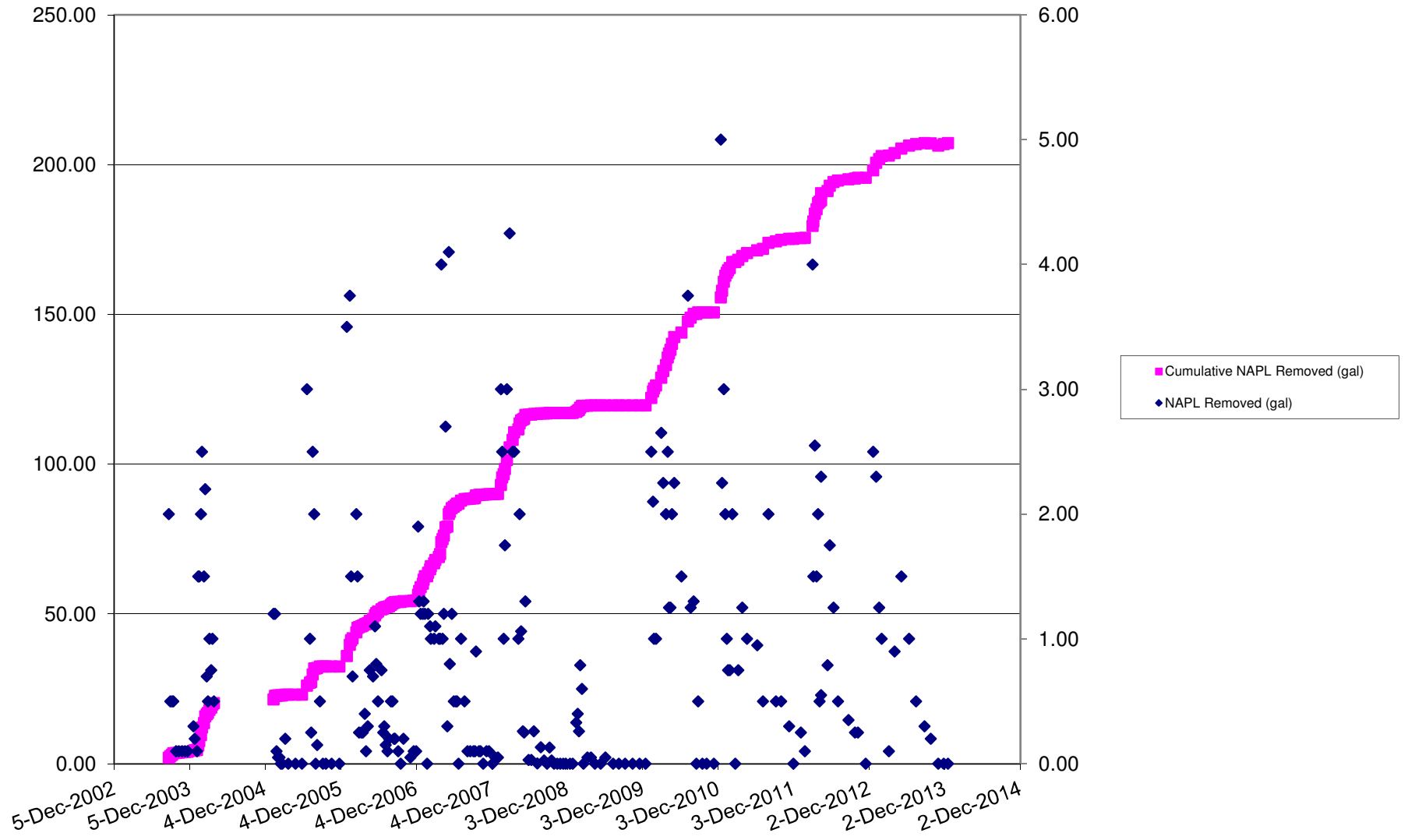
MW-17



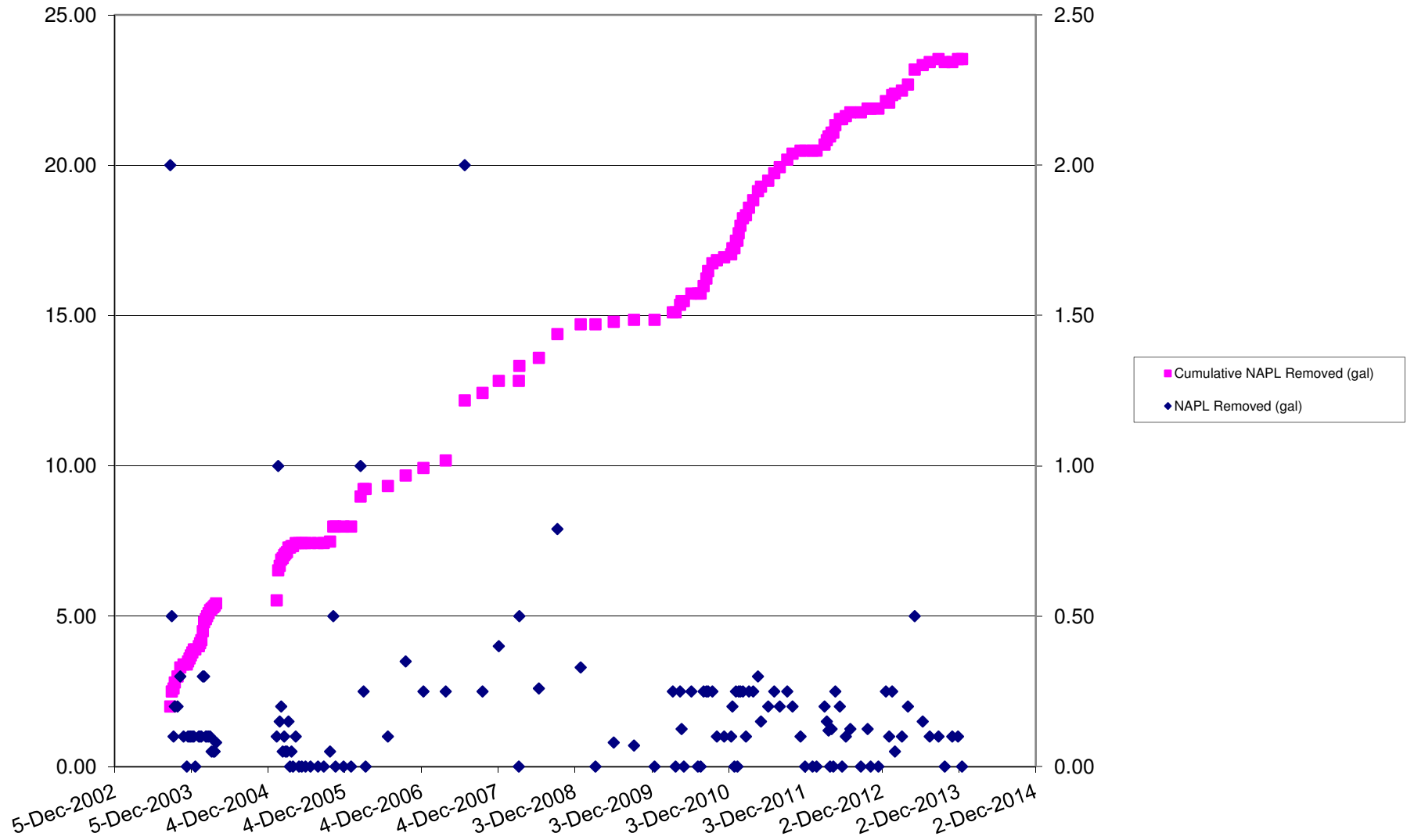
MW-19



MW-20



HC-10



BE-4

